TASK ES-8-18

FINAL REPORT

NATIONAL STEEL & SHIPBUILDING CO.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JAN 1985	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
National Steel and Shipbuilding Company Methods/Labor Standards Application Program	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**18**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

NATIONAL SHIPBUILDING RESEARCH PROGRAM

THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS

SHIP PRODUCTION COMMITTEE

PANEL SP-8

NATIONAL STEEL AND SHIPBUILDING CO.

METHODS/LABOR STANDARDS APPLICATION::PROGRAM

FINAL REPORT

TASK ES-8-18

Submitted to:

Mr. Joseph R. Phillips

MarAd Program Manager and Chairman

SNAME Panel SP-8 on Industrial Engineering

Bath Iron Works Corporation

700 Washington Street

Bath, Maine 04530

Conducted by:

National Steel & Shipbuilding Co.

Harbor Drive & 28th Street

San Diego, CA 92138

January, 1985

This project is managed and cost-shared by National Steel and Shipbuilding Company for the National Shipbuilding Research Program. The Program is a cooperative effort of the Maritime Administration's Office of Advanced Ship Development, the U.S. Navy, the U.S. shipbuilding industry, and selected academic institutions.

National Steel and Shipbuilding Company is the largest shipbuilder on the West Coast. It is a wholly-owned subsidiary of Morrison-Knudsen Company of Boise, Idaho. For the last ten years, NASSCO has been the leading producer. of tankers for U. S. Flag Merchant Marine Service delivering over 40% (29 ships) of all new tankers built in the United States. NASSCO is also a leading producer of U. S. Navy auxiliary and amphibious ships. Since 1969 NASSCO has delivered or has contracted to build or convert 25 ships for U. S. Navy service.

NASSCO is a full service repair and conversion yard for the commercial and U. S. Navy markets, having accomplished hundreds of overhauls, retrofits, and repair jobs on all types of vessels including Navy combatants. A 1,000' x 176' graving dock is available for repair work. A new 25,000 ton floating drydock that is 620' in length and 170' wide with 140' clear between wingwalls, is now in service.

In addition to ship related work, NASSCO provides steel fabrication and machine shop services to a wide variety of industrial customers in the southern California area.

NASSCO'S present SNAME Panel SP-8 project of the Application of Engineered Labor Standards within shipyards has been indeed a true research and development endeavor. Our efforts this year have been totally in NASSCO'S Maintenance Department which consists of 139 persons operating on a budget of over $5,400,000. The department consists of two major sections. One area is Electrical Maintenance, and the other is Mechanical Maintenance. Further divided is Mechanical Maintenance, which supports all mechanical equipment, as well as Transportation. We have centered our study particularly on the Transportation Maintenance area which includes all rolling stock such as forklifts, scooters, manlifts, trucks, buses, automobiles, and cranes.

"Maintenance" refers to activities that fight defects in existing equipment without changing the design of the equipment. Maintenance activities comprise lubrication, conservation, looking for defects, cleaning, and repairing. Maintenance is a very critical component of our manufacturing company. The basic reason for maintenance management is to maintain and is to perform essential work while controlling maintenance costs. We are trying to do this by increasing the effective use of budget and personnel by providing

a means for continuous evaluation of equipment, manpower requirements , and, last but certainly not least, analysis, of operations and performance.

One way for our Transportation Maintenance Department to become more efficient was by increasing the effectiveness of the Maintenance Supervisor. To do this, however, the department had to switch from the usual practice of breakdown maintenance (making repairs only on reported deficiencies) to planned maintenance (preventive and corrective maintenance work performed prior to breakdowns). Also, we needed the use of a maintenance-management control system.

The term “Preventive Maintenance” means “Periodic Maintenance”. Even though the word “preventive” tends to draw attention to the goal of the activity (prevention) rather than to the activity itself (periodic action), we exclude from the definition of preventive maintenance all activities that are not carried out on a periodic scale, even when they would prevent other defects and accidents.
We have been operating our Transportation Preventive Maintenance group for three years. It has decreased the need for new transmissions and hydraulic pumps by 90%. It keeps moving parts in working condition. It is inexpensive maintenance. At the present time, we have no control over water pumps, but we will start draining and flushing radiators on a regular preventive maintenance basis with the intent of cutting down radiator problems and repair costs. To further illustrate the value of Preventive Maintenance, note the following. It cost approximately $20 for a radiator to be maintained while it costs $250 plus down time to replace a radiator.

Also, we have attempted to further improve our efficiency with the use of a Maintenance-Management control system.

Our Panel SP-8 project is actually three phases. Phase One was testing a micro-computerized Maintenance Management system. Phase Two, our primary and most important task, is the transfer of labor standard data across the industry. Phase Three will be a manual performance rating reporting system utilizing our Engineered Labor Standards that are the result of our data transfer.

Although NASSCO had a semblance of a computerized Maintenance Management control system for approximately six years on the company’s Mainframe computer, for several reasons it appears more advantageous to use a personal in-department system. Our Chief

Of Maintenance and Manager of Information Systems searched for several months. The company that they found was J. B. Systems which has the Mainsaver system.

Mainsaver is an off-the-shelf turenkey computerized Maintenance Management system. It is a product which is a functional tool for the Maintenance Manager. It provides top management with timely and comprehensive reports on the activities of the Maintenance Department and the cost of those activities.

There are several good points about the Mainsaver system. They are:

1. It is an online, database system.

2. It does not require “data processing personnel to operate the system, and is operated by the Maintenance personnel.

3. It has the capacity to contain the Master Equipment list, the Inventory List, the Personnel List and the Preventive Maintenance requirements in terms of both calendar and usasge.

4. It produces Work orders from both Preventive Maintenance requirements and other scheduled work requests.

5. It tracks and reports on the status of all open Work Orders.

6. It allows Maintenance Management to forecast manpower requirements for scheduled and Preventive Maintenance for up to one year.

7. It contains online maintenance history by equipment for at least one year.

8. It tracks spare parts usage equipment.

9. It produces Reorder Reports to be used by Purchasing to order spare parts as needed.

10. It provides top management with timely and meaningful reports

which describe the activities and costs involved in running the Maintenance Department.

11. It allows the user to formulate his own special reports.

12. It permits telecommunication linkage between the Maintenance computer and the Company's Mainframe.

In spite of the many advantages of the Mainsaver System, it failed to blend in and did not work out satisfactorily for us. The problems encountered with Mainsaver were capacity, matching, turn key system to NASSCO'S existing main frame, and inflexibility.

The-time needed for every single operation in our Maintenance Transportation Preventive Maintenance is estimated for several reasons.

1. To be able to establish whether Preventive Maintenance is profitable.

2. To be able to have the necessary personnel available.

3. To be able to allocate an adequate day's work to your personnel.

4. To be able to make the best use of limited shutdown periods.

5. To have a rough measure of performance.

We do not use these time estimates for work measurement or incentive schemes. Many of our P. M. operations cannot be checked closely enough. Too, our workers are expected to deal with minor defects as they encounter them and without a separate order having to be issued. We do not expect our maintenance men to have a separate work order for every single instance that may occur. The paperwork would be horrendous. In practice, it is impossible to cover by planning every instance.

Therefore, I have differentiated, for my purposes, between

basic times and allowance times. Basic times are the times required to carry out individual tasks and allowance times cover the activities that occur irregularly. We do not have times for situations such as:

1. Repairs that are not carried out with each individual operation.

2. Additional jobs arising from an unforeseen or abnormal condition in the shipyard.

This is a three phase project.

1. Mainsaver - computerized
   Maintenance Management

2. Transfer of Engineered Performance Standards for
   Public Works Maintenance into labor standards for
   NASSCO'S Transportation Maintenance Group

3. Manual performance reporting for NASSCO'S transportation maintenance employees

The most important phase of our project provides for a demonstration of the transferability of indirect standard data that currently existed outside the shipbuilding, industry.
We are using Engineered Performance Standards which are approximately 4,000 elemental time standards developed by Engineering Field Division Industrial Engineers and Industrial Engineering Technicians which are the foundation blocks for the Navy's Engineered Performance Standards (EPS) for Public Works Maintenance.

Savings per year that have been gained due to SP-8 participation.

$100,000 for forklift up time gained
$ 40,000 for elimination of clerical position
$ 30,000 for reduction of ISD support required

Information Systems Dept.

We anticipate savings well over $1,000,000 as our preventive maintenance and transferability of data project concludes.

Human beings are important to Preventative Maintenance because nearly all maintenance activities are human activities, almost entirely controlled by the individuals carrying them out. Unless these individuals do the job and do the job properly, even the most perfect procedure will never achieve anything.

	Visual inspect part small	390.0 TMU
	Visual inspect part medium	464.4 TMU
	Visual inspect part large	1061.1 TMU
1058	Pour or drain oil per gallon from crank cases, gear boxes	.0079 Hours
1059	Prepare to wipe oil or grease on large part	1918.2 TMU
1060	Remove approx. 1 quar of 2130 oil from crank case of machine with 3/8 pint capacity hand suction gun	.0250 Hours
1097	Obtain Fork Truck and move to receive part	1502.7 TMU
1165	Apply grease to small part	176.2 TMU
1644	Sweep	
1645	Sweep	
1647	Pick up sweepings	
1656	Waste dispose of	
2058	Equipment adjustments or minor repairs	.0952 Hours
2147	Fill tank per gallon	.0027 Hours
2388	Turn switch on or off	128.8 TMU
2392	Start generator	426.3 TMU
2400	Open or close oil valve	72.5 TMU
2402	Turn coolant on and off	186.4 TMU
2572	Remove and lay aside parts per piece	
2594	Read dimension from blueprint	575.5 TMU
2601	Inspect work	.0084 Hours
2605	Check motor bearings for noise while operating	953.5 TMU
2606	Check motor bearing for temperature while operating	71.4 TMU
2610	Inspect, feel with fingers	59.2 TMU
2627	Fork lift, move 20 feet	.0029 Hours
2628	Fork lift, raise and lower 10 feet	.0115 Hours
2759	Hand carry motor components approv. 15 feet from work-bench to cleaning booth hydraulic press or test panels	.0095 Hours
2765	Get hand truck and place components on truck	.0089 Hours
2766	Pull hand truck with comp. approx. 15 feet	.0041 Hours
2847	Pick up part and move to assembly:	
	small	184.4 TMU
	medium	227.6 TMU
	large	250.7 TMU

2851	Turn part over small to medium	76.0 TMU
	large	110.8 TMU
2888	Get tool fromtool room	1024.4 TMU
2889	Get wrench to change blades - return wrench	422.9 TMU
2895	Get parts and tools from tool box	.0067 Hours
2897	Obtain screw and postion to wire	46.6 TMU
2901	Cloth, obtain or put away	52.1 TMU
2903	Pick up small particle off floor	122.6 TMU
2905	Towels, paper (2) obtain	65.2 TMU
2911	Pick up and lay aside file or stone	43.7 TMU
2921	- 2925 Get and aside tools	
2928	- 2936 Get and aside tool, electric tool, towel	
3008		
3147	Apply oil to bearing or part per application or per squirt	122.8 TMU
3148	Apply grease to medium part	250.3 TMU
3149	Lubricant apply grease with a paddle	104.6 TMU
3150	Spread oil with paint brush (small part)	91.4 TMU
3152	Bearing (motor), lubricate	236.3 TMU
3153	Cup (grease), screw down	153.6 TMU
3154	Remove and reinstall grease cup	503.5 TMU
3155	Gun (grease) attach to Zerk fitting and remove from fitting hand operated grease gun	148.3 TMU
3156	Pump grease gun handle once against major resistance or several times against minor resistance	.0010 Hours
3157	Oil - hole (no cover)	206.8 TMU
3158	Oil - hole (spring lid or ball cover)	229.4 TMU
3159	Pour 2 oz. oil	.0017 Hours
3160	Pour 24 oz. oil	.0074 Hours
3176	Lid, install on can ,	159.7 TMU
3180	Open and close tool case	95.7 TMU
3184	Remove gas tank cap on trimmer and replace	211.0 TMU
3195	Hand, wipe with cloth or paper towel	160.0 TMU
3194	Wash hands and/or tools in bucket of water	.0062 Hours

3196	Dip rag in solvent and squeeze	244.2 TMU
3197	Clean small part before installing	414.0 TMU
3208	Wipe grease from finger	159.4 TMU
3209	Wipe rough surface	145.2 TMU
3210	Part, clean grooves/concave corners only	301.4 TMU
3212	Part, clean with rag, part on bench medium	486.8 TMU
	small	257.6 TMU
3214	Wipe large part, large fixture, machine column with towel	193.3 TMU
3230	Wipe oily threads or parts	182.1 TMU
3231	Wipe part (small)	412.3 TMU
	(medium)	1510.4 TMU
	(large)	3526.2 TMU
3241	Part small wipe with rag	50.0 TMU
3248	Adjust each jack to exact height under part	259.5 TMU
3273	Position small wrench to nut or bolt and remove after use	63.6 TMU
3289	Position part in a complex fixture	710.3 TMU
3293	Remove each part from simple fixture	39.0 TMU
3294	Remove each part from average fixture	56.9 TMU
3295	Remove part from complex fixture	239.6 TMU
3296	Remove part from centers	29.0 TMU
3304	Unfold drop cloths or fold	382.7 TMU
3305	Drag or position hose per occurrence	170.0 TMU
3311	Remove pins, gasket and scrap material and set aside	251.7 TMU
3358	Jack, place under rail and tighten, raise jack one stroke	144.9 TMU
3359	Handle, place in jack	75.2 TMU
3400	Kneeling on knee boards, move to next location	625.2 TMU
3402	Get and place nut on bolt and engage threads	86.8 TMU
3406	Nut, seat with wrench and remove wrench	191.3 TMU
3532	Pick up stepladder and put down	316.5 TMU
3533	Climb and descend tower	.0373 Hours
3534	Climb truck, ladder to tower, ladder and return	.0086 Hours
3561	Jack, adjust to approximate height	174.6 TMU

3739	Get our of pick up truck	.0016 Hours
3740	Get into pick up	.0030 Hours
3749	Move funnel into oil hole and remove	85.5 TMU
3800	Obtain scale measure and aside	138.0 TMU
3802	Door (offic), unlock	143.4 TMU
3803	Unlock and open window	81.9 TMU
3804	Close and lock window	1516.9 TMU
3820	Open and close cabinet door	214.4 TMU
3821	Dispose of rags, paper; etc. in trash can located outside of building	2376.3 TMU
3822	Cleanup of the job location	.0718 Hours
3823	Empty scrap metal container and return	
3824	Wash hands	.0240 Hours
3835	Clean out tank (inside and out)	.0307 Hours
3837	Water, wash down job site (300 sq. feet)	.03 Hours
3842	Walk unobstructed or with load to 50 pounds per pace (walk 10 paces)	150.0 TMU
3843	Walk obstructed or with load over 50 pounds per 10 paces (walk 10 paces)	170.0 TMU
3855	Check out or in tool	2209.0 TMU
3861	Tool, small, obtain and place aside	64.3 TMU
3869	Get tool from carrying bag and give to stock clerk	204.4 TMU
3871	Obtain tool from clerk and place in carrying bag	195.7 TMU
3874	Pick up rag or tool and lay aside	120.5 TMU
3875	Obtain note pad from pocket and return	201.6 TMU
3884	Pick up rag or tool and lay aside	120.5 TMU
3889	Jack, get from under rail	100.5 TMU
3903	Carry heavy part from tool crib to truck location and return	635.3 TMU
3904	Load heavy tool onto truck and unload from truck	379.5 TMU
3905	Pick up supplies and/or equipment and lay aside	764.7 TMU
3908	Wind rope around motor wheet	.0025 Hours
3909	Button depress (doorbell or similar)	45.4 TMU
3910	Pull rope to start motor	.0008 Hours
3911	Shut motor	.0010 Hours

3912	Turn machine on or off	194.2	TMU
3913	Start or stop compressor	.0030	Hours
3915	Put work gloves on hands and remove	.0048	Hours
3921	Check fuel, oil, cooling water and other gages before starting	.0113	Hours
3922	Check boom, operation, including brakes, clutches, governor control, lever and stop control upon starting, or lock housing, secure brakes, disengage clutch and raise boom upon securing	.0046	Hours
3923	Obtain and examine stub	276.0	TMU
3924	Fill out material “chit” and sign	1063.2	TMU
3925	Insert stock number on, or sign stub requisition	222.9	TMU
3926	Sign instruction sheet after job.	191.2	TMU
3927	Waiting time for air pressure to increase and decrease	.0209	Hours
3928	Pre-planning on average emergency/service call	.034	Hours
3932	Pick up carrying bag and set down		
3933	Move equipment or material sised at job site and move back after job	412.5	TMU
3935	Move heavier tools or equipment to truck location. Move from truck location to job site.	2009.8	TMU
3940	Part pick up and set down	180.4	TMU
3942	Slide or push heavy object near and return (2 Men) elapsed time	.0142	Hours
3944	Obtain hand box - replace	370.4	TMU
3945	Obtain tool box from shelf and return	438.8	TMU
3947	Move tools or material on job site	.0131	Hours
3948	Put hose in pick up (per section)	.0063	Hours
3950	Pick up material or tools O set down after moving them	251.4	TMU
3952	Hand crank gas starter motor for diesel (cold starting)	.0330	Hours
3953	Warm up diesel engine to rated operating temperature	.0719	Hours
3954	Crawler crane travel - 300 yards	.3410	Hours
3955	Wait on test per 6 minutes $\frac{6 \text{ Minutes}}{60 \text{ Min/hr}}$	.1000	Hours
3959	Water, flush inside of equipment	.0280	Hours
3960	Water, wash down inside of tank	.0225	Hours
3964	Phone, dial for transportation after completion of job	1119.0	TMU
3965	Remove or replace tarpaulin on material pile	734.7	TMU

3966	Tripod (with vise) set up to use	313.4 TMU
3968	Verbal instructions get from supervisor	.1211 Hours
4005	Dial supervisor on telephone	235.3 TMU
8034	Remove and reassemble ball, roller, or sleeve bearing from shaft and rotor or armature, wire brush, clean & inspect motor	.1592 Hours
4150	Jack, place under rail and tighten, raise jack each additional stroke	16.2 TMU
4105	Turn screw 360 degrees	24.0 TMU
4123	Wipe machine table, vise, surface gage, or square	80.8 TMU
4124	position part or fixture against stop (each stop)	34.9 TMU
4125	Pick up and lay aside medium part	77.5 TMU
4126	Retighten vise by hand	34.1 TMU
4127	Measure, mark with pencil using a pattern (per sign)	219.0 TMU
4128	Vise, close and open vise on object	230.0 TMU
4129	Adjust vise as necesarry (open or close)	53.5 TMU
4131	Position tool to work	103.6 TMU

OPERATION SUMMARY

OPERATION CODE 005

DATE 10-84 | PAGE 1 OF 1

OPERATION No. 5 | OPERATION CHANGE ENGINE OIL

DEPARTMENT MAINTENANCE | DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance | EQUIPMENT TRUCK, CAR, BUS, FORK LIFT | ANALYST Barb Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Inspect work	Occ.	2601	.0084	2	1680.0
2.	Open) & close oil valve	Occ.	2400	72.5	2	145.0
3.	Pour & drain) oil per gallon in can	Occ.	1058	.0079	1	790.0
4.	Cloth obtain &) put away	Occ.	2901	52.1	3	156.3
5.	Wipe) large part, large fixture, machine) column) with towel	Occ.	3214	193.3	2	386.6
6.	Hand wipe) with cloth or paper towel	Occ.	3195	160.0	3	480.0
7.	Move funnel into oil hole and remove	Occ.	3749	85.5	1	85.5
8.	Pour) 24 oz oil	Occ.	1058	.0074	1	740.0
9.	Turn) machine) off to on to off	Occ.	3912	194.2	3	582.6
10	Sign) instruction sheet) after job	Occ.	3926	191.2	1	191.2

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU	5,237.2
TOTAL WITH ALLOWANCE 15 %	6,022.8
STANDARD ALLOWED HOURS PER	.0602

OPERATION SUMMARY

OPERATION CODE: 010

DATE:

PAGE: OF

OPERATION No.: 10

OPERATION: CHECK BATTERY - Add Water

DEPARTMENT: MAINTENANCE

DIVISION: Transportation

DIVISIONAL DEPARTMENT: (Preventive Maintenance)

EQUIPMENT: fork lift, Truck, Car, Bus

ANALYST:

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME THU	FREQ.	TOTAL THU
1	Turn machine on & off	OCC	2388	128.8	2	257.6
2	Inspect work	OCC	2601	.0084hr	2	1,680.0
3	Put hose in pickup (per section)	SECTION	3948	.0063hr	12	7,560.0
4	Set, place, put all bolts engage threads	NUT	3402	86.8	12	1,041.6
5	Water, flush) inside of equipment	OCC	3959	.0280hr	1	2,800.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL THU	13,339.2
TOTAL WITH ALLOWANCE 15 %	15,340.1
STANDARD ALLOWED HOURS PER (Occurrence)	.153

OPERATION SUMMARY

OPERATION CODE 014

DATE 10-84 | PAGE 1 OF 1

OPERATION No. 14 | OPERATION OIL ALL CONNECTING SHAFTS AND LEVERS

DEPARTMENT MAINTENANCE | DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance | EQUIPMENT FORK LIFT | ANALYST Barb Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Remove and reassemble (all, roller or sleeve bearing from shaft and rotor or armature), wire brush, clean and inspect motor.	Occ.	8034	.1592	1	1592.0
2	Pick up and lay aside (medium) part	Part	4125	77.5	9	697.5
3.	Dip rag in solvent and squeeze	Occ	3196	244.2	10	2442.0
4.	Wipe (machine table, rise, surface) gage or square.	Occ.	4123	80.8	9	727.2
5	Oil hole (No cover)	Occ.	3157	206.8	5	1034.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU	20,820.7
TOTAL WITH ALLOWANCE 15 %	23,943.8
STANDARD ALLOWED HOURS PER	.2394